

DATE PREPARED: June 11, 2007		ISS PAYLOAD OFFICE PIRN/EXCEPTION FORM		PAGE 1 OF 7	
Doc. No., SSP 57213, Initial Release Rev. & Title: Alpha Magnetic Spectrometer (AMS) Interface Control Document			PIRN No: 57213-NA-0008		
TITLE: AMS (Alpha Magnetic Spectrometer) – On-orbit Operations Envelope Exceedance					
Originator: Name: Trent Martin Agency: NASA JSC AMS Project Office / EA Phone: 281-483-3296 Email: trent.d.martin@nasa.gov		PIRN Type: <input type="checkbox"/> Standard PIRN <input checked="" type="checkbox"/> Exception		FAX Approval Signatures to this Number: 314-777-2866	
Utilization Change Engineer: Name: Leonardo Cornejo Agency: Boeing PEI Phone: 281-226-4644 Email: Leonardo.A.Cornejo@boeing.com		SSCN/CR N/A		RELATED PIRN No.: N/A	
Agency Tracking No.: 57213-0004		SYSTEM/ELEMENT AFFECTED & STAGE EFFECTIVITY: AMS – Launch through End Of Life			
REASON FOR CHANGE OR REQUIREMENT(S) VIOLATION: AMS exceeds on-orbit operational enveloped defined in SSP-57003, Paragraphs 3.1.3.1.1.1.					
PARAGRAPHS, FIGURES, TABLES AFFECTED (For PIRN use only)					
<u>Page</u>	<u>Paragraph(s)</u>	<u>Figures(s)</u>	<u>Table(s)</u>	<u>R</u>	<u>A</u>
3-9, 3-10	3.1.3.1.1.1	3.1.3.1.1.1-1	N/A		
AFFECTED INTERFACING PARTIES					
	SIGNATURE & ORGANIZATION	DATE	SIGNATURE & ORGANIZATION	DATE	SIGNATURE & ORGANIZATION
C O N C U R	/s/ Gene Cook/ OZ3	03/26/09	/s/ Rod Jones/ PCB	02/27/09	/s/ Larry Grissom/ NASA EVR
	/s/ Vic Sanders/ Boeing PEI	02/25/09	/s/ Chris Schmitt/ Boeing EVA	01/12/09	/s/ Rodney Nabizadeh/ OM6
	/s/ Sharm Baker/ S&MA	01/15/09	/s/ Lori Crocker/ NASA EVA	01/08/09	/s/ Rafael Garcia/ OB4
	/s/ Trent Martin/ AMS	01/08/09	/s/ Kirsty Reidy/ Boeing EVR	02/20/09	/s/ Bob Jones/ GSFC ELC
					/s/ Alan Guerra/ PICB
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SSP 57003 Requirement:

Requirement Number: 3.1.3.1.1.1
Requirement Title: PAYLOAD ATTACH SYSTEM UNPRESSURIZED
LOGISTICS CARRIER ATTACH SYSTEM ON-ORBIT
OPERATIONAL ENVELOPE

Attached Payloads and equipment shall be designed such that the payload does not exceed the allowable On-Orbit operational envelope in accordance with Figure 3.1.3.1.1.1–1, Operational Envelope.

Proposed AMS Payload Exception:

Requirement Number: 3.1.3.1.1.1
Requirement Title: PAYLOAD ATTACH SYSTEM UNPRESSURIZED
LOGISTICS CARRIER ATTACH SYSTEM ON-ORBIT
OPERATIONAL ENVELOPE

Attached Payloads and equipment shall be designed such that the payload does not exceed the allowable On-Orbit operational envelope in accordance with Figure 3.1.3.1.1.1–1, Operational Envelope. **Except the AMS payload violates this Operational Envelope as shown in Figure 3.1.3.1.1.1-AMS, and figure 15 from MAGIK AI 2279 Rev A.**

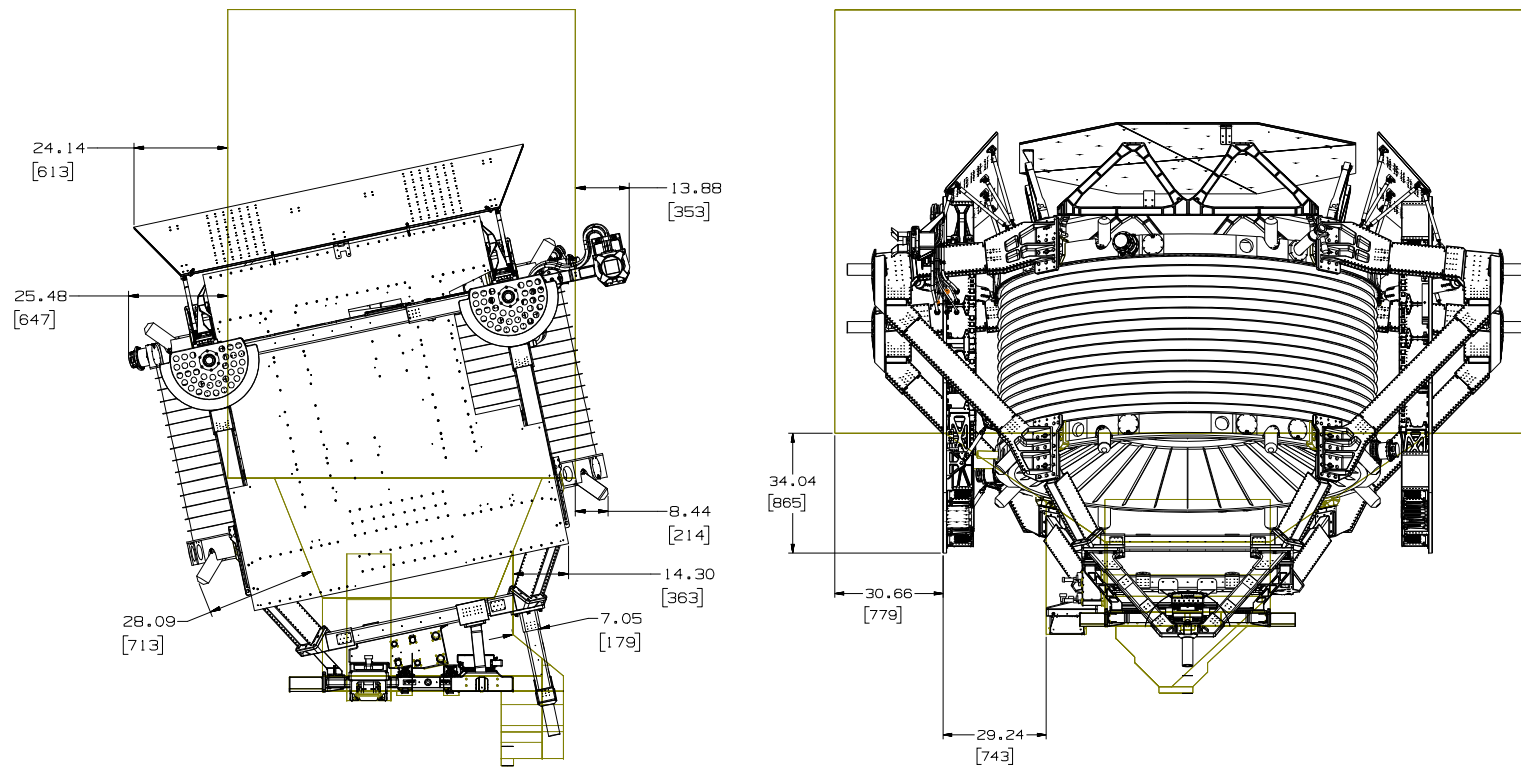


Figure 3.1.3.1.1.1-AMS: AMS Exceedances of Generic AP Envelope (For reference only)

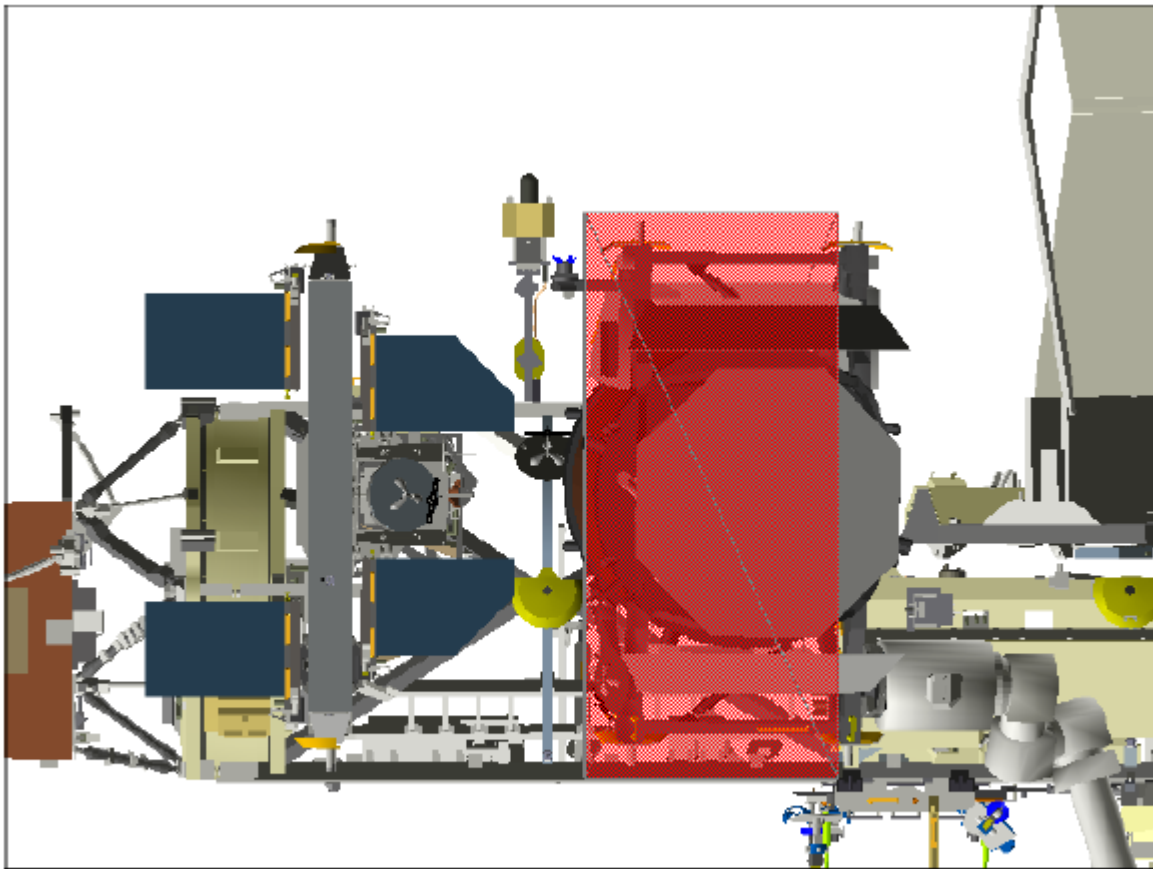


Figure 15: AMS Violation of S3 Attached Payload Envelope
View Looking ISS Nadir

Rationale:

The AMS payload inside diameter was set by the diameter of the Tracker flown on STS-91. When the permanent magnet flown on STS-91 was replaced by a superconducting magnet for the ISS flight, the outside diameter had to be extended. Every effort was made to minimize the size of the AMS magnet, but in order to meet the science goals of AMS, the magnet had to be built such that it is larger than the payload envelope of the ISS Attached Payload IRD. This was not helped by the fact that the envelope was not defined until after the AMS magnet diameter was determined. In addition to this envelope exceedance, the payload has been tilted 12 degrees inboard on ISS. This was done for two reasons, 1) to minimize the interferences with the adjacent attached payload and 2) to minimize the blockage of the AMS primary field of view by the ISS solar arrays. In order to assess the impact of these interferences, the AMS payload, along with the ISS payloads office, have performed extensive analyses and testing of these envelope exceedances. The assessments have included MAGIK analyses of payload berthing (MAGIK Action Item #'s 1110, 1146, 1174, 1192, 1254, 1595, 1705, 2172, and 2279), EVA worksite analyses (LMSO Q105743), and NBL tests (Crew Consensus Report 11.12.02). All of these analyses and tests were undertaken to ensure that there will be no physical interferences during all on-orbit phases and maximize the clearances to neighboring payloads.

PEI Analysis:

PEI agrees with the EVA analysis reports (on EDMS): D684-13036-01 (EVA Analysis Report AMS to S3 Contingency CAS Release); D684-13037-01 (EVA Analysis Report AMS PPAS and S3 PAS UMA); and D684-13038-01 (S3 EVA Secondary Translation Path with AMS Installed), which identified two AMS violations against SSP57003, EVA requirements: 3.11.1.1 (EVA TRANSLATION PATH INTERFERENCE) and 3.11.2.3 (WORKING VOLUME). Exceptions 57213-NA-0005 and 57213-NA-0006 for these violations were presented to the EVA-AIT and were approved on September 4, 2008. A Floating Potential Measurement Unit (FPMU) is currently installed on S1 and needs to be removed from there prior to AMS installation. See figure AMS-AA-01 FPMU Installed on S1.

PEI also agrees with the results of the analysis performed by the Assembly Analysis team as documented in presentation: AMS Analysis Results, dated 11/10/08 (Attached to this exception), which shows that in order to avoid any interference between the AMS and the adjacent payload (ELC2 according to the current manifest plan), during AMS installation, the ELC2 62" payload envelope (from the surface of the ELC deck to the height of the generic payload volume) needs to be reduced to 59.8" (2.2" reduction). This number is the result of the maximum misalignment during AMS installation (2.5° wobble, 1.5° Roll) on S3 upper inboard. Figure AMS-AA-02 below from page 7 in Assembly Analysis Results shows the reduction on ELC2 to avoid the interference during AMS installation. The results of this analysis were presented to OM6 on 11/18/08 and obtained their concurrence. Same analysis was presented to the End to End Berthing Integration Team (EBIT) on December 3, 2008. The EBIT had no issues with this analysis.

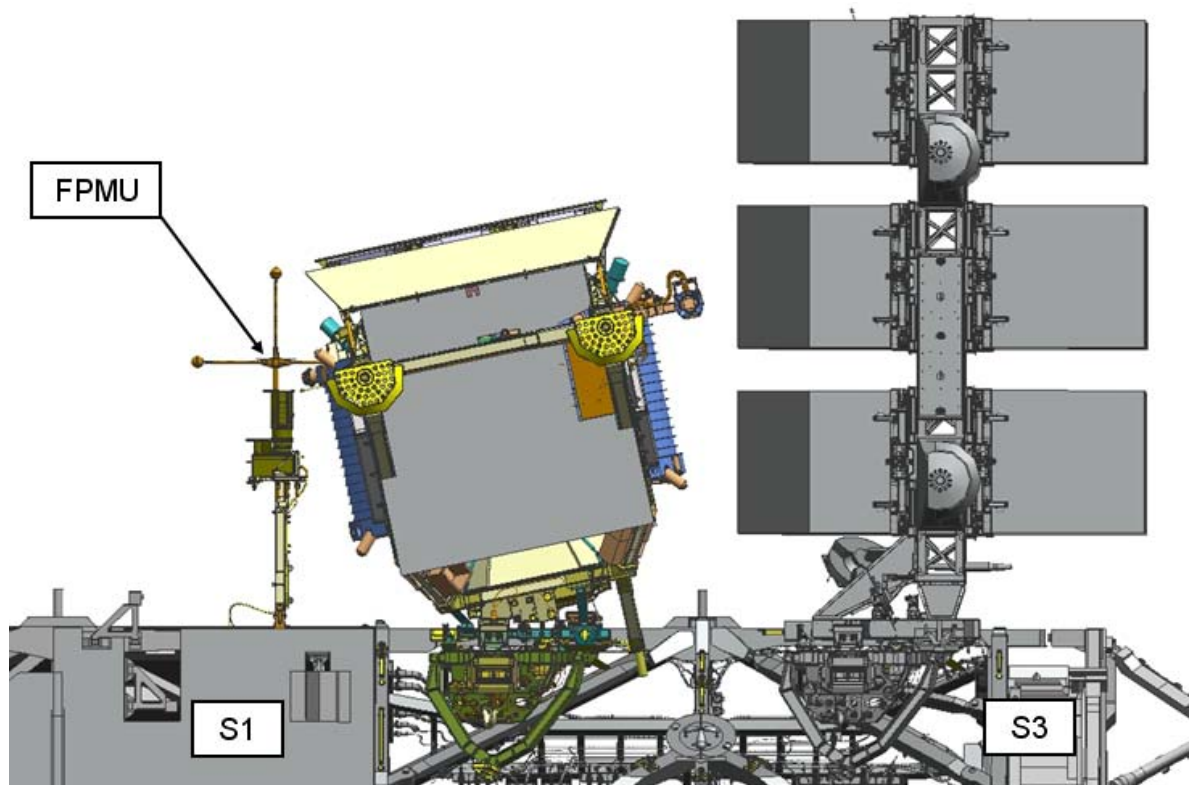


Figure AMS-AA-01 FPMU Installed on S1

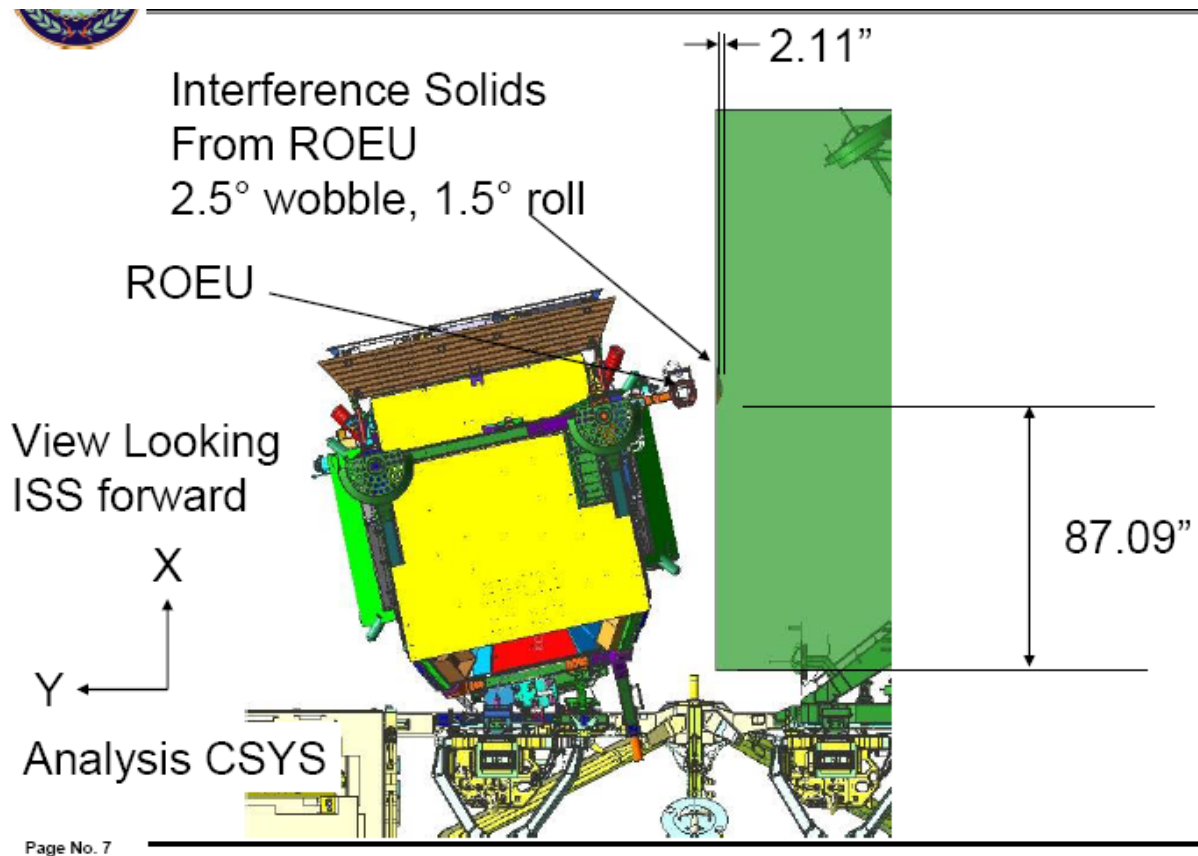


Figure AMS-AA-02 (From page 7 on AMS Analysis Result Presentation)

PEI Recommendation:

Approve as written.

Operational Constraints: (As Needed)

1. The Floating Potential Measurement Unit (FPMU) shall be removed prior to AMS installation.

Rationale:

The FPMU is currently installed on Camera Port (CP) 2 and interferes with S3 upper inboard PAS site which is where the AMS will be installed.

2. No payload/ORU as installed on the ELC's top deck at S3 upper outboard adjacent to AMS (Currently ELC2) shall be taller than 59.8" (from the surface of the ELC deck to the height of the generic payload volume), as defined by the Assembly Analysis report: AMS Analysis Results.

Rationale:

According to the current manifest plan, the adjacent payload to the AMS is ELC2. The ELC payload envelope in the direction of the AMS is 62" (from the surface of the ELC deck to the height of the generic payload volume). The Assembly Analysis team performed an analysis that shows a maximum of 59.8" for the ELC2 payload envelope to avoid any interference during the AMS installation on S3 upper inboard.

PTR Recommendation:

Approved as written.

PCB Disposition:

Approved as written.